

Space Shuttle/International Space Station Earth Observation Photography

Astronauts have used hand-held cameras to photograph the Earth for more than 30 years, beginning with the Mercury missions in the early 1960's. Since 1981, Space Shuttle astronauts have taken 300,000 photographs of the Earth. **The International Space Station (ISS)** will continue the NASA tradition of Earth observation from human-tended spacecraft. Earth observation documented with hand-held cameras will begin even before assembly is complete. The ISS will be well suited for observations: Its average altitude will be 220 miles (407 km) above the Earth. Its orbital inclination of 51.6° includes most of the coastlines and heavily populated areas of the world.

The U.S. Laboratory Module will have a window, with a clear aperture 50.8 cm in diameter, that will be perpendicular to the Earth's surface most of the time. The window's three panes of fused silica give it "optical quality." Instrumentation for Earth observation will include, but not be limited to, Hasselblad, Linhof, and Nikon hand-held cameras, plus sensors and imaging systems still to be developed.

Astronauts are trained in scientific observation of geological, oceanographic, environmental, and meteorological phenomena, and in the use of photographic equipment and techniques. Training assists



Above: International Space Station (ISS). Below: Astronaut on-board the Space Shuttle taking photographs of Earth with a hand-held camera.



astronauts in making informed decisions about which areas and phenomena to photograph.

Shuttle hand-held photography fills a niche between aerial photography and imagery from unmanned satellite scanners and complements these two formats with additional information. Photographs, electronic images, and verbal observations made by the flight crews of the International Space Station will continue this tradition and also educate students and the general public about the Earth. An astronaut, trained in the Earth discipline sciences, can rapidly identify and photograph interesting and unplanned phenomena, interpret what has been observed, and modify planned activities as

needed. Near real-time information exchange between the crew and scientists expedites the recording of dynamic events of geological, oceanographic, environmental, and meteorological importance. Critical environmental monitoring sites are photographed repeatedly over time; some have photographic records dating back to the Gemini and Skylab missions. Earth limb pictures taken at sunrise and sunset document changes in the Earth's atmospheric layering. Photographs of hurricanes, thunderstorms, squall lines, island cloud wakes, and the jet stream supplement satellite images by offering high resolution, stereoscopic coverage of such phenomena.

How to View Images and Obtain Information on Astronauts' Photographs

World Wide Web -

At the following URL's:

<http://eol.jsc.nasa.gov>
<http://earth.jsc.nasa.gov>
<http://images.jsc.nasa.gov>
<http://nix.nasa.gov>
<http://shuttle.nasa.gov>

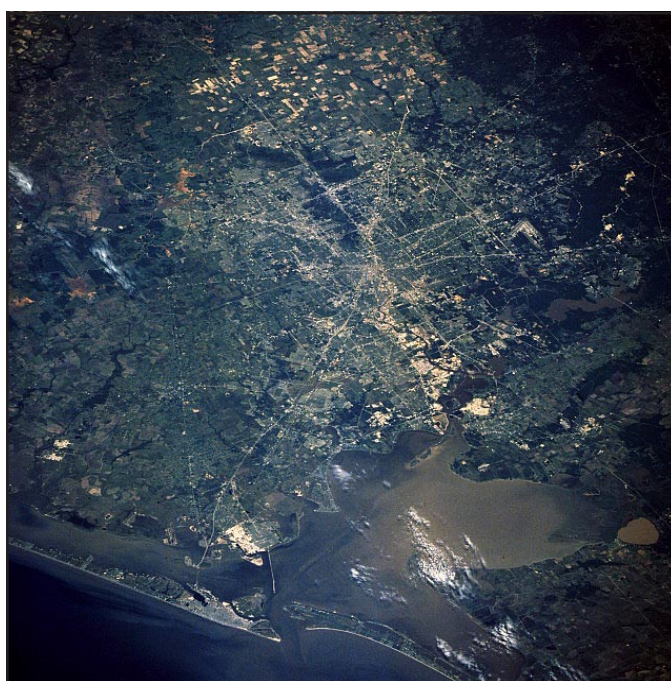
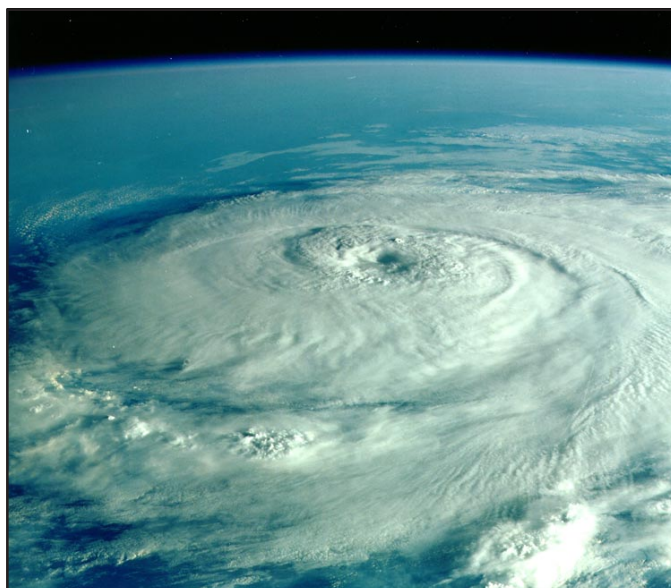
Prints, slides, and transparencies -

Earth Data Analysis
Center (EDAC)
University of New
Mexico
Albuquerque, NM
87131-6031
Phone: (505) 277-3622;
Fax (505) 277-3614

Media Services
Corporation
Media Resource Center
NASA/Johnson Space
Center
P.O. Box 58425, Mail
Code AP42
Houston, TX 77258-
8425
Phone: (281) 483-4231
Fax: (281) 483-2848

Earth Resources
Observation Systems
(EROS) Data
Center

Customer Services
Sioux Falls, SD 57198
Phone: (605) 594-6151
Fax: (605) 594-6589



*Top photo: Hurricane Elena, Gulf of Mexico, September 1, 1985.
Bottom photo: Houston/Galveston region of the Texas Gulf coast.*

Videodiscs -

NASA CORE
Lorain Country Joint
Vocational School
15181 Route 58 South
Oberlin, OH 44074
Phone: (440) 774-1051
Ext. 700

For more information write to:

Dr. Kamlesh Lulla, Chief
Office of Earth Sciences
Mail Code SN13
Johnson Space Center
Houston, TX 77058
Phone: (281) 483-5066
Fax: (281) 483-2911
klulla@ems.jsc.nasa.gov



National Aeronautics and
Space Administration
Lyndon B. Johnson Space Center
Houston, Texas 77058

June 1999